

Trace Gas Observations from Whole Air Samples:

- Organic Nitrates, HCFCs, Halocarbons, etc.
 - b) GC/MS characterization

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TRACE-P Science Team
CO/Ozone/PANs, etc.

Sample/Analytical Protocol

Sample Collection: UCI

Laboratory Analysis: UCI Laboratory (>5000 samples)

[NCAR collaboration: selected analytical channels;
standards: (RONO₂, HCFCs, other, MSD)]

Selected sample transfer: (cryogenic) to NCAR canisters

Laboratory Analysis: NCAR (>650 Samples)

GC/MSD: Target compound analysis (SIM)

GC/MS: Full scan (semi quantitative) characterization

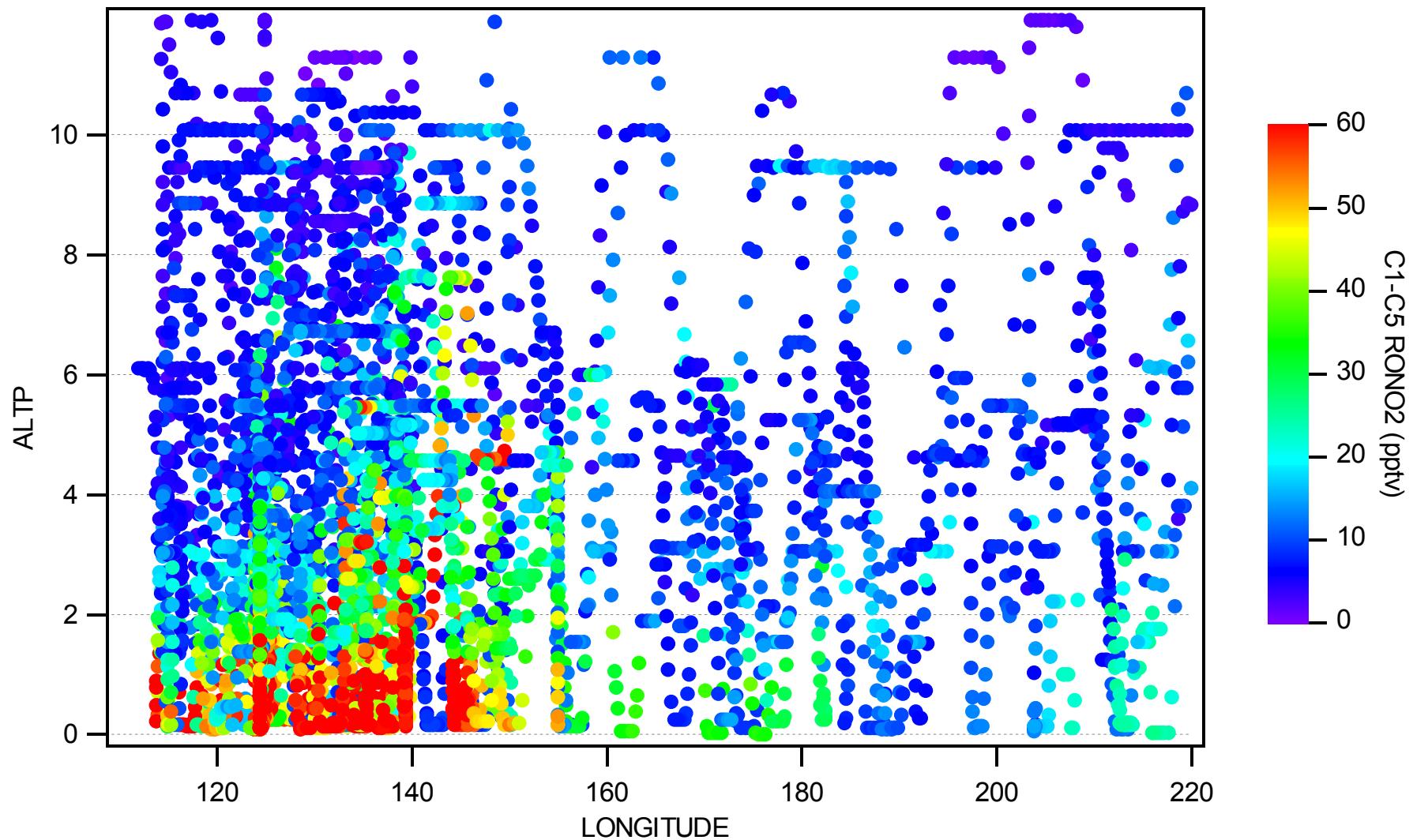
Target (SIM) compound analysis by GC/MSD: NCAR analyses

CFCs	RONO₂	C1/C2 Halocarbons	Sulfur			
CFC 11	MeONO ₂	CH ₃ Cl	OCS			
CFC 12	EthONO ₂	C ₂ H ₅ Cl	DMS			
CFC 113	i-PropONO ₂	CH ₃ Br				
CFC 114	n-PropONO ₂	n-Propyl Bromide	<u>Carbonyl</u>			
CFC 115	2-ButylONO ₂	CH ₃ I	2-Butanone			
	3-Me-2-BuONO ₂		n-Butanal			
Halons	3-C ₅ ONO ₂	CH ₂ Br ₂	Methacrolein			
Halon 1301	2-C ₅ ONO ₂	CHClBr ₂				
Halon 1211		CHBr ₃				
Halon 1202	NMHCs	C ₂ H ₃ Cl (Vinyl chloride)				
Halon 2402	Propene	CH ₂ Cl ₂				
	Propane	CHCl ₃				
	Isobutane	1,2-C ₂ H ₄ Cl ₂				
HFC/HCFCs	n-Butane	CH ₃ CCl ₃				
HFC 134a	Cyclopentane	CCl ₄				
HCFC 21	Benzene	C ₂ HCl ₃ (Trichlorethane)				
HCFC 22	Toluene	C ₂ Cl ₄ (Perchlorethane)				
HCFC 123	o-Xylene					
HCFC 124	Iso-propyl benzene					
HCFC 141b	n-Propyl benzene					
HCFC 142b	a-Pinene					
	d-Limonene					

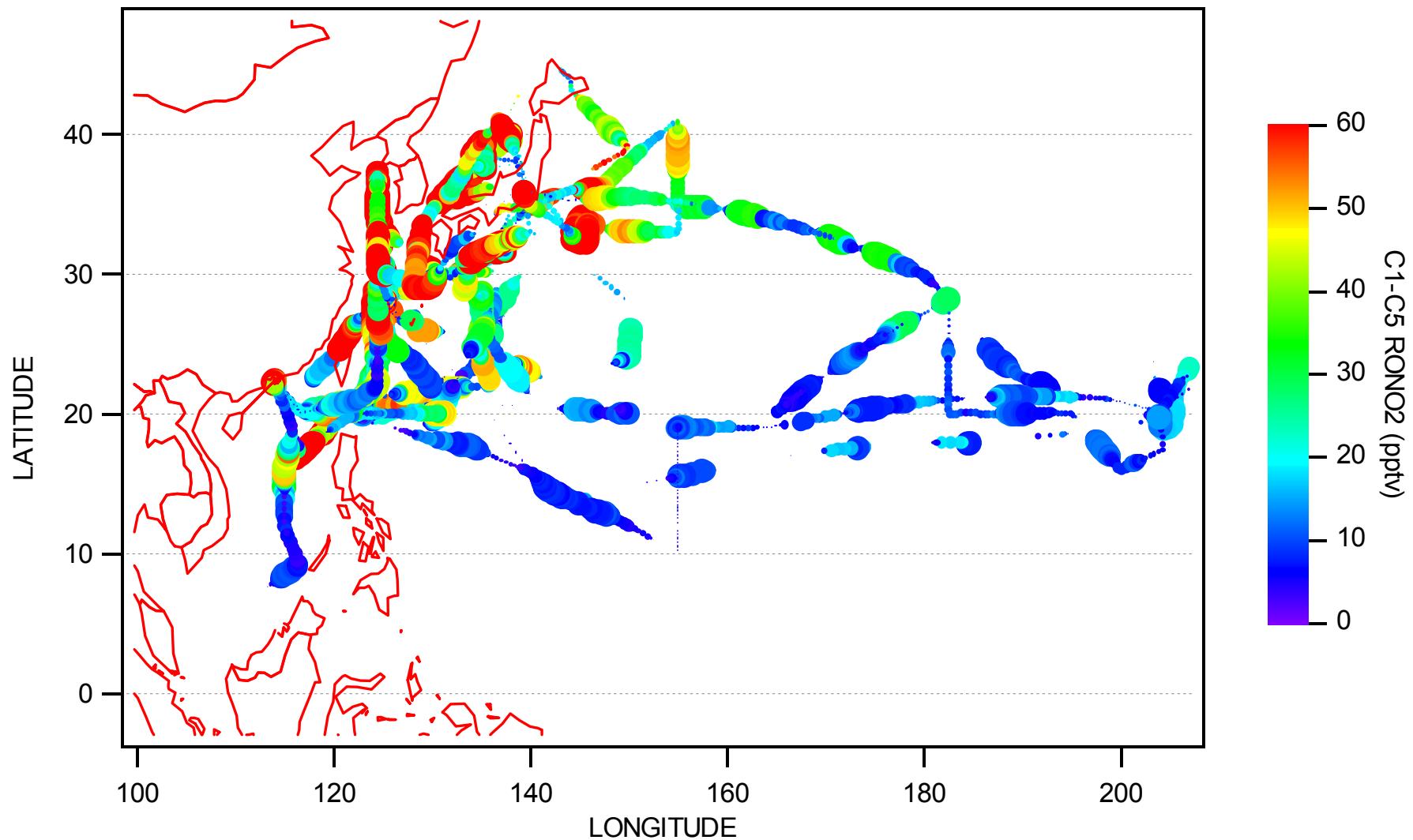
GC-MS characterization of whole air samples during TRACE-P

N M H C		Carbonyl	Other oxygenated	Halogenated	N-containing
>C 3 alkanes	aromatic	C 2	alcohols		nitriles
isobutane	benzene	acetaldehyde	m ethanol	1,1 dichlorethane	acetonitrile
butane	toluene	C 3	ethanol	1,2 dichlorethane	2-Propenenitrile
isopentane	ethylbenzene	propanal	isopropanol	2-chloropropane	nitriles
pentane	m, o, p-xylene	2-propenal(acrolein)	1-propanol	1,2-dichloropropane	nitromethane
2-methylpentane	C 3-benzenes	acetone	1-butanol		
3-methylpentane	C 4-benzenes	C 4	2-methyl2-propanol	chlorobenzene	
hexane	naphthalene	2-methylpropanal	ethers	dichlorobenzene	
heptane		m ethacrolein	methylt-butylether		
octane		m ethylvinylketone	esters		
nonane		butanal	methylformate	Sulfur species	
decane		2-butanone	methylacetate	CS2	
undecane		biacetyl	ethylacetate	DMS	
Various branched alkanes		C 5	isopropylacetate		
		3-methylbutanal			
Cycloalkanes		2-ethylacrolein	RONO2		
cyclopentane		2-pentanone			
methylcyclopentane		pentanal			
cyclohexane		C 6			
alkynes		2-hexanone			
Propyne		3-hexanone			
		hexanal			
		cyclohexanone			
>C 3 alkenes		C 7			
1-butene		3-heptanone			
1,3 butadiene		2-heptanone			
		heptanal			
		m ethylisobutylketone			
		Other			
		2-ethylhexanal			
		benzaldehyde			
		octanal			
		nonanal			
		decanal			

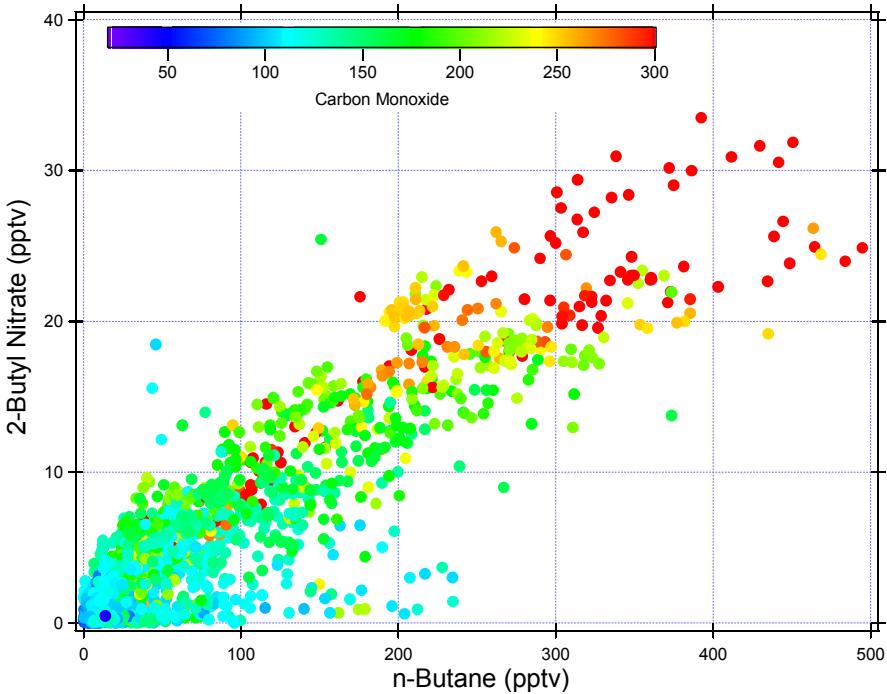
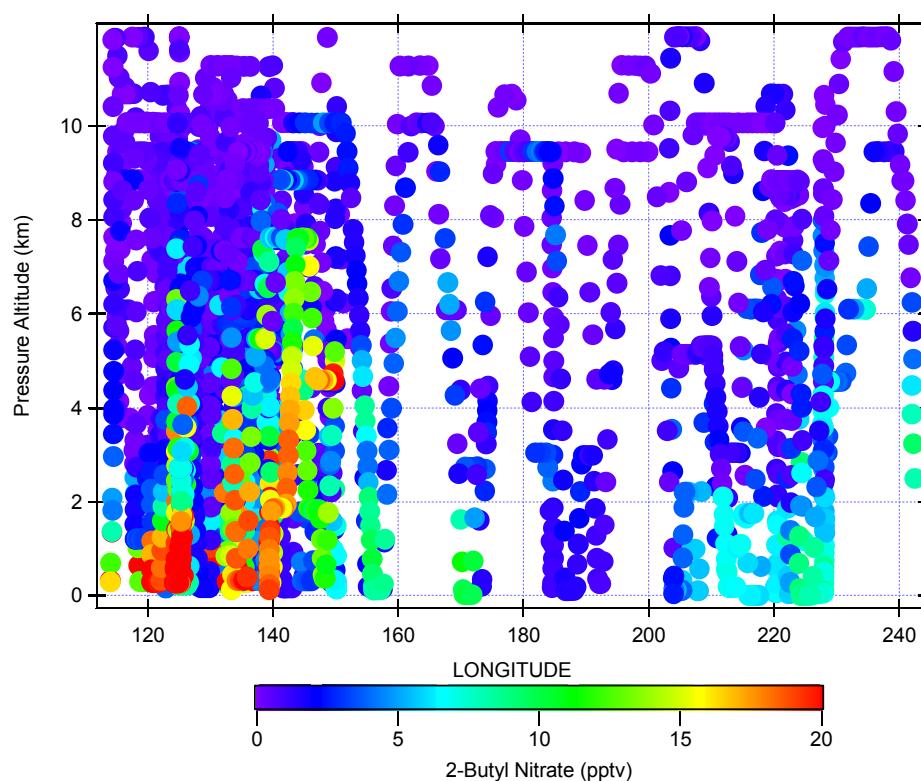
Total C₁ – C₅ RONO₂: Vertical Section during TRACE - P



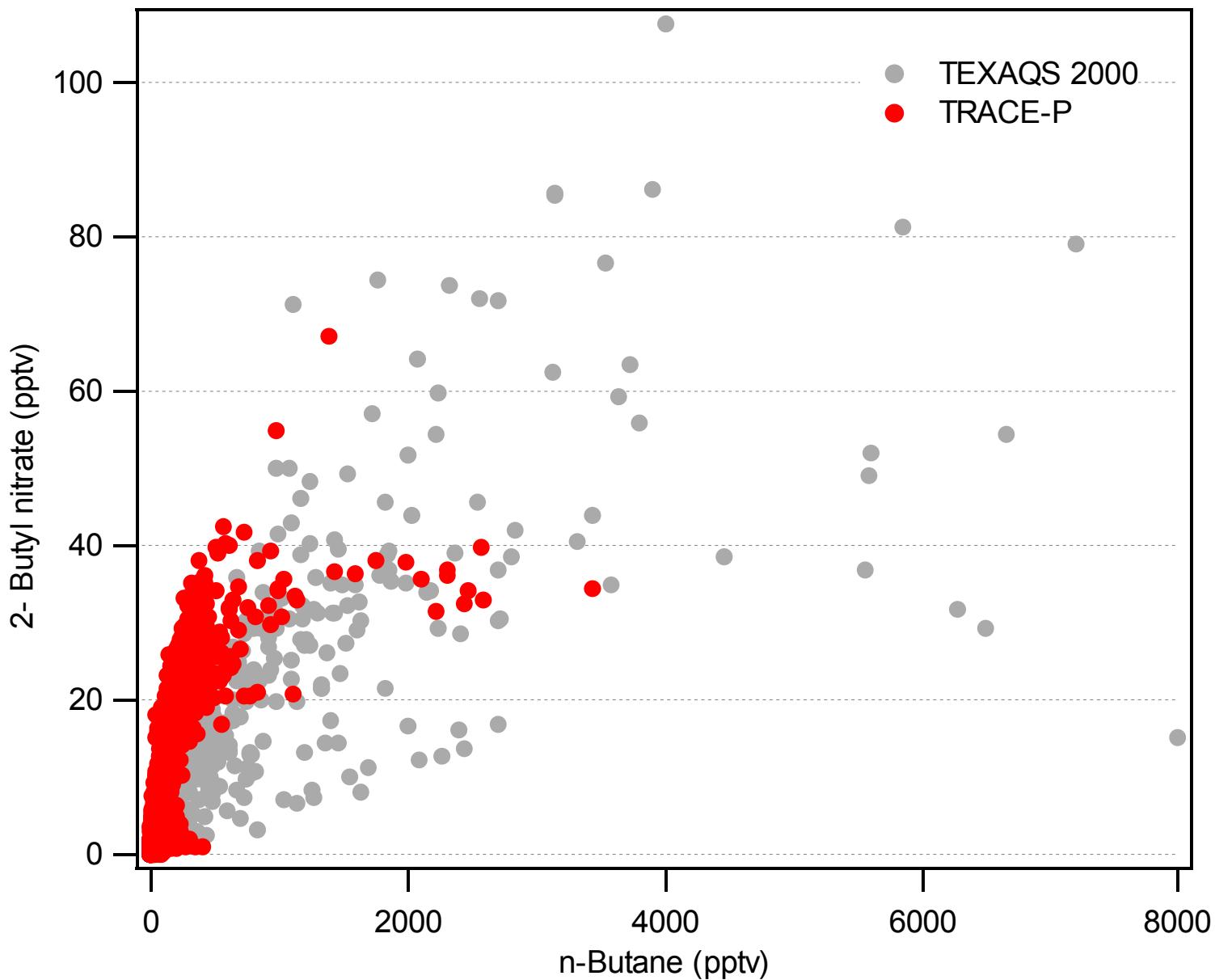
Total C₁ – C₅ RONO₂: Horizontal distribution during TRACE - P



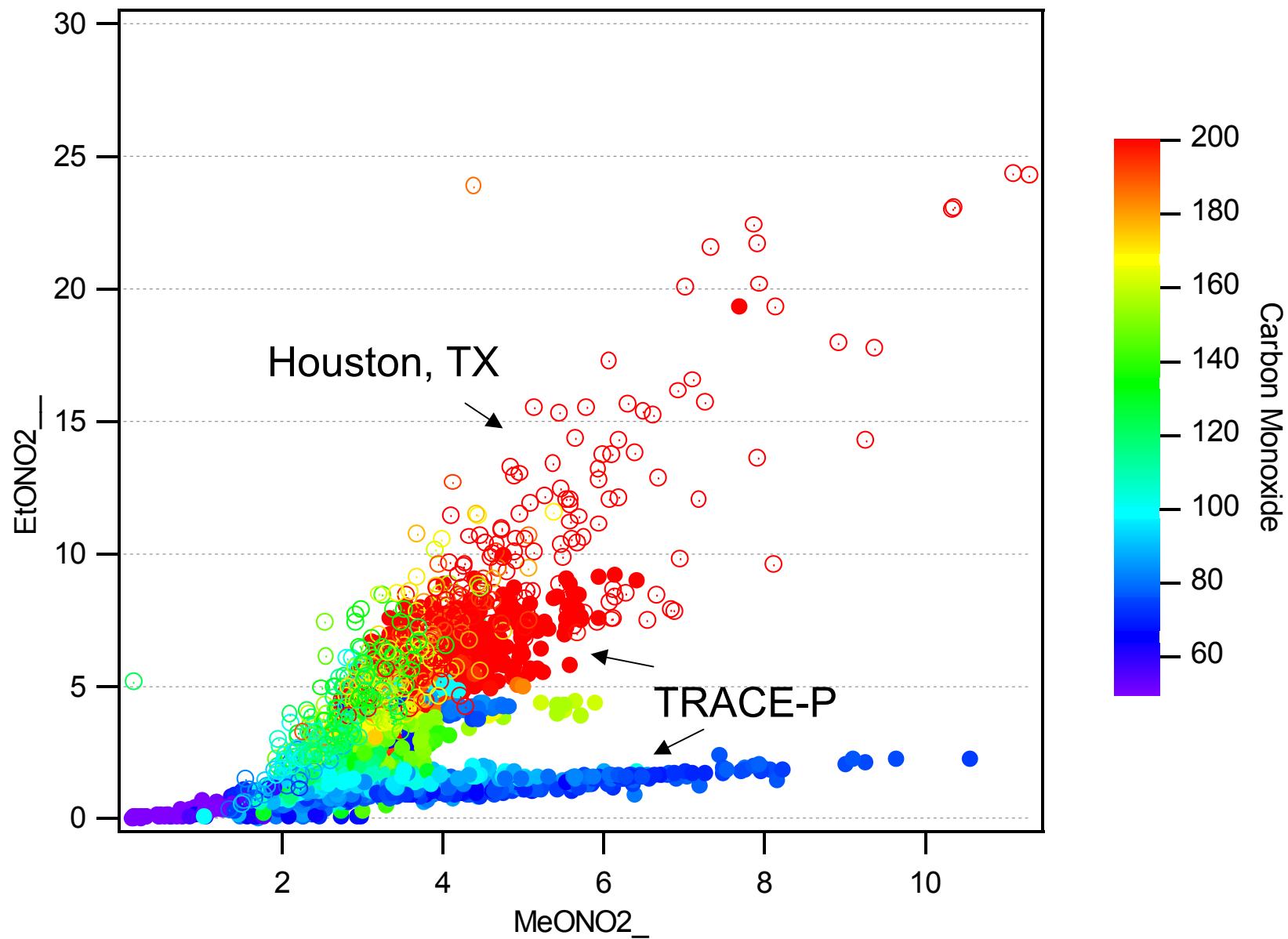
2-Butyl Nitrate: Photochemical Oxidation Source



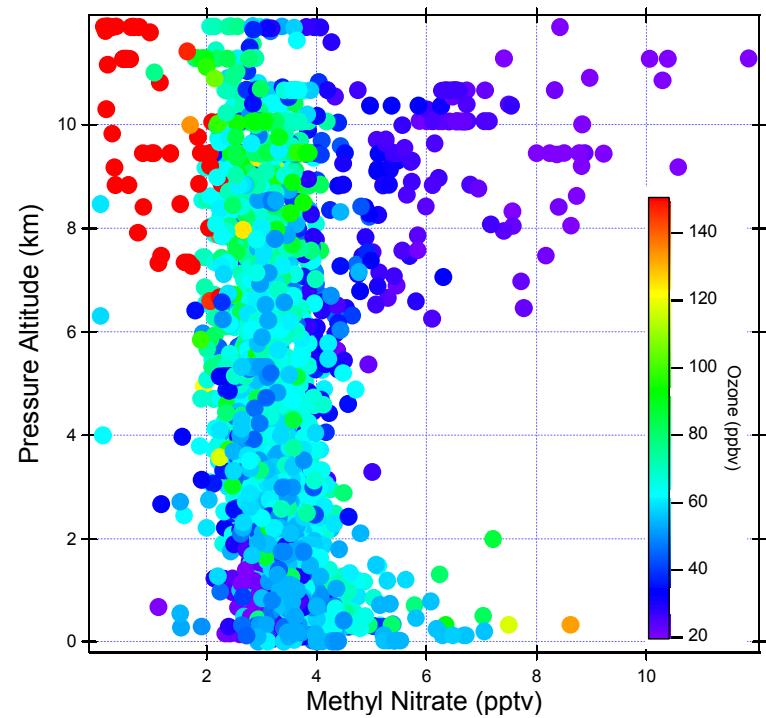
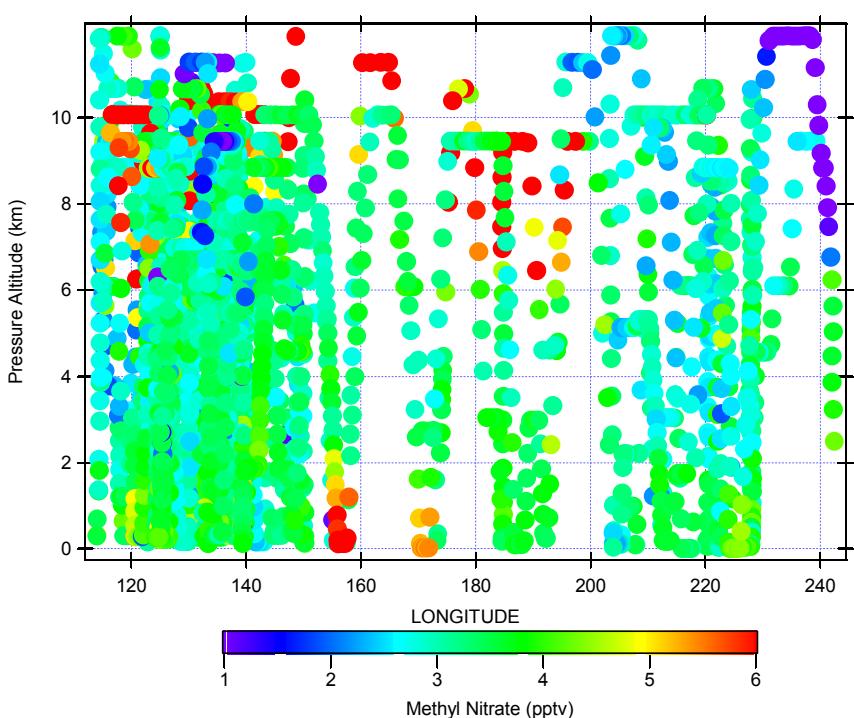
RONO₂: RH relationship TRACE-P and TEXAQS 2000



Methyl Nitrate: Ethyl Nitrate TRACE-P and TEXAQS 2000

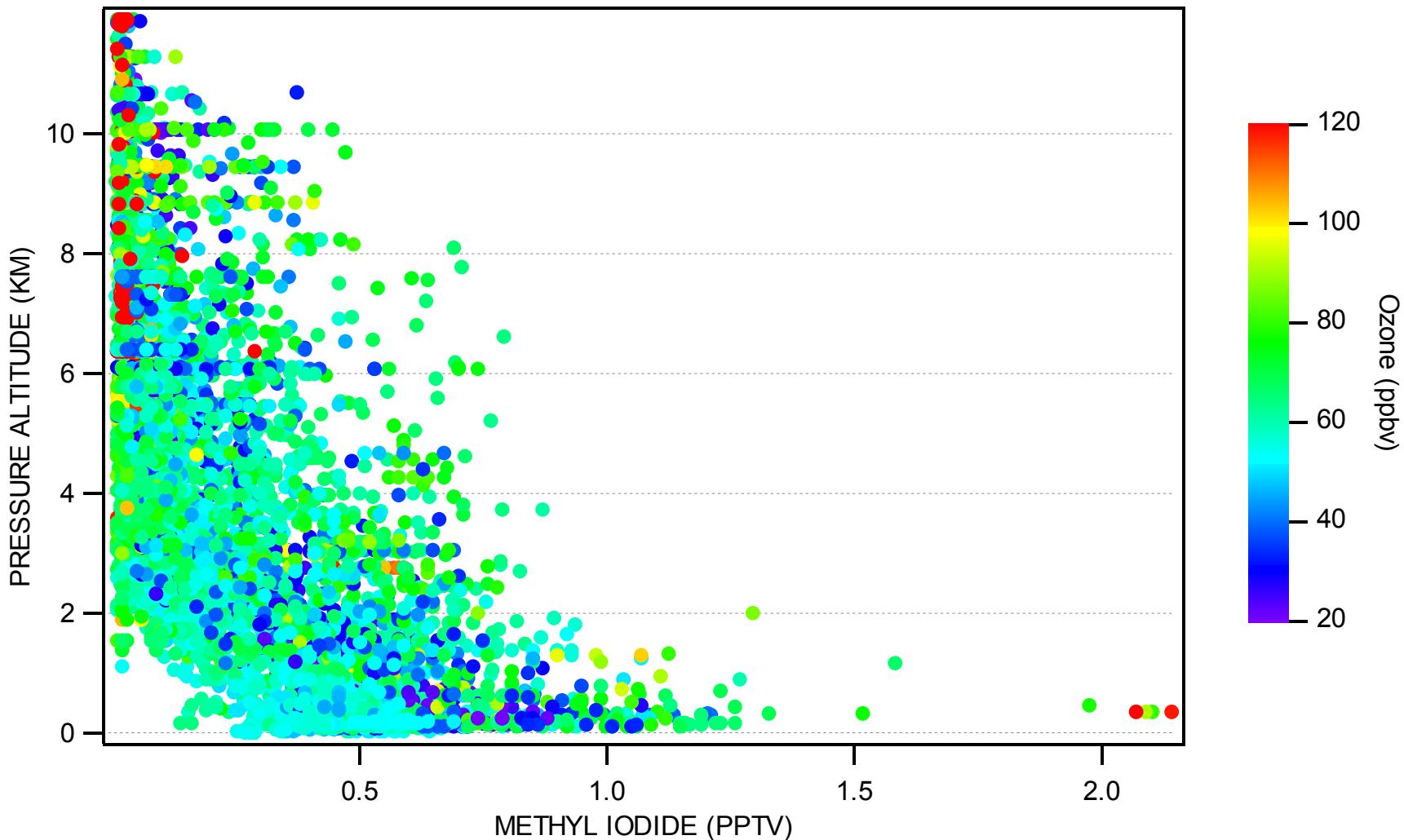


Methyl Nitrate: Tropical MBL Tracer

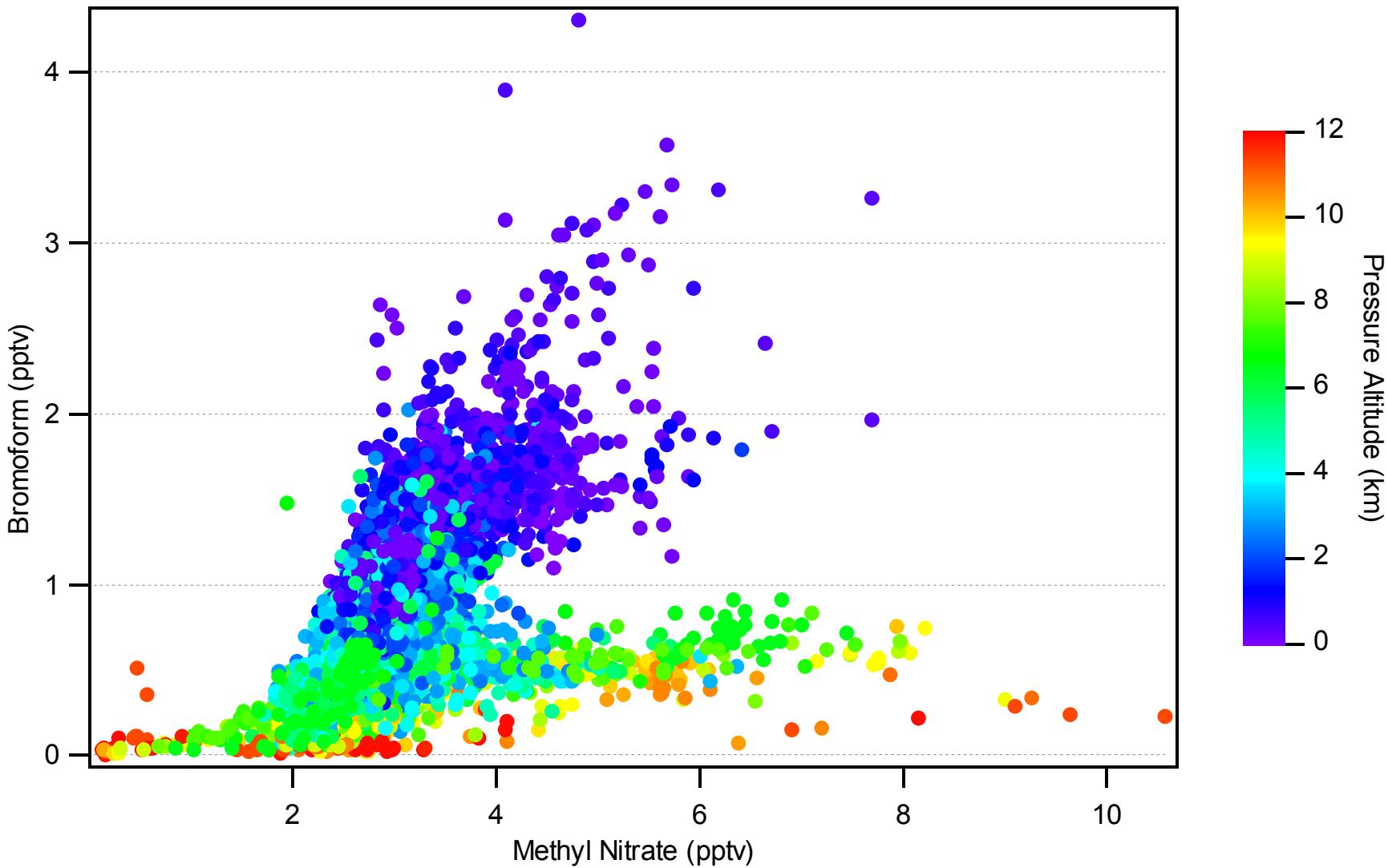


Tropical Convection:
(High MeONO₂; low O₃)

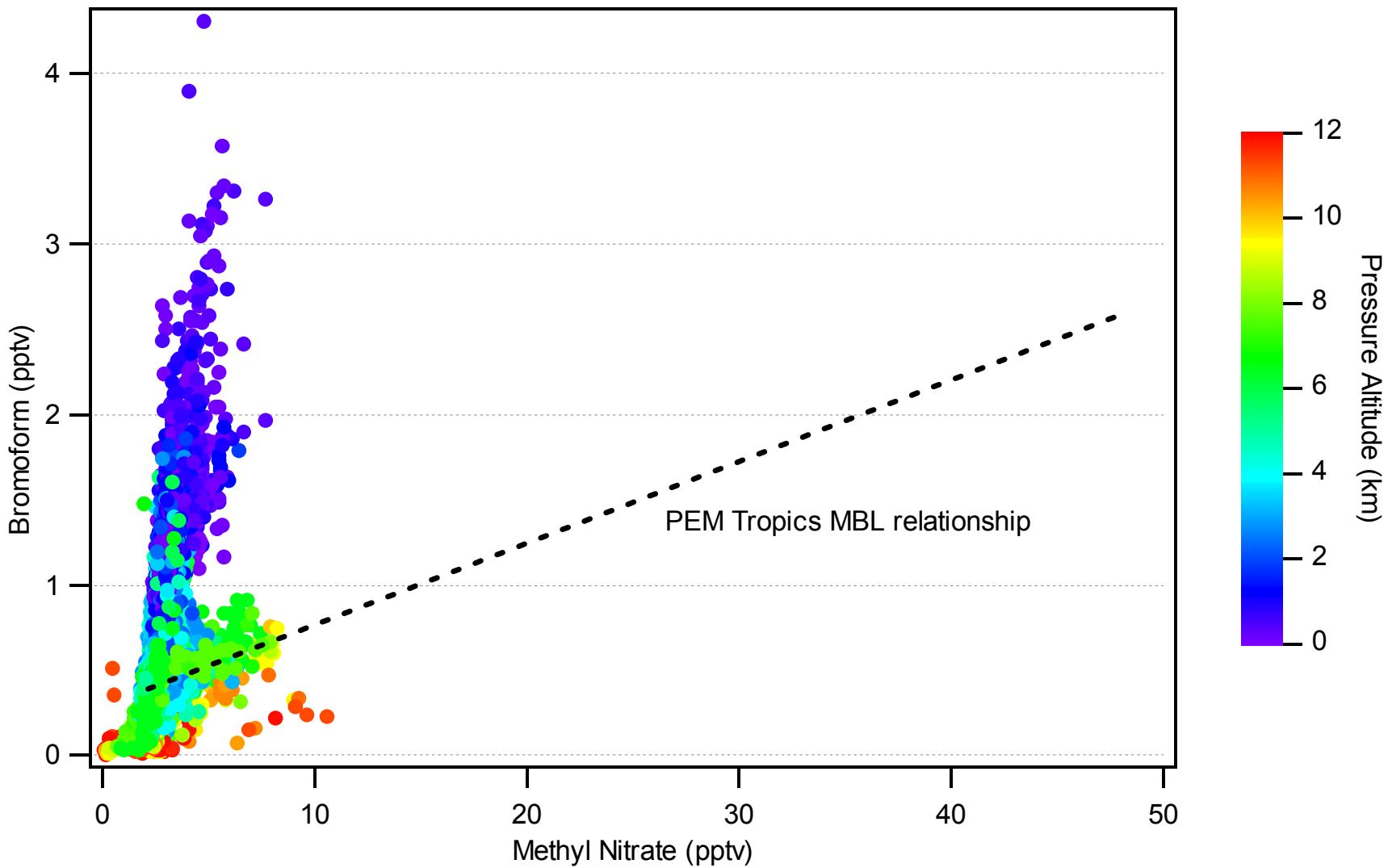
Methyl Iodide Vertical Distribution During TRACE-P



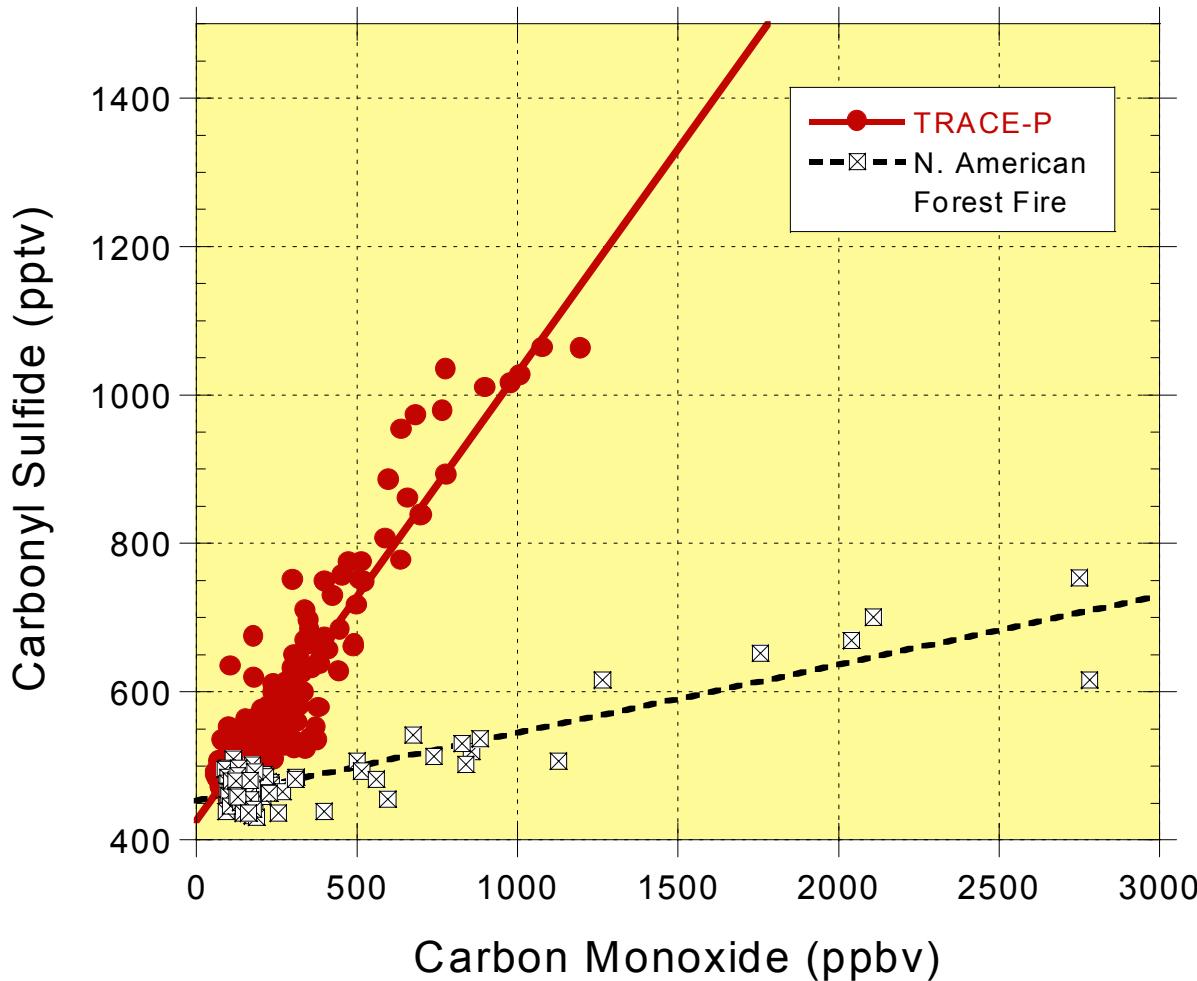
Methyl nitrate: bromoform relationship during TRACE-P



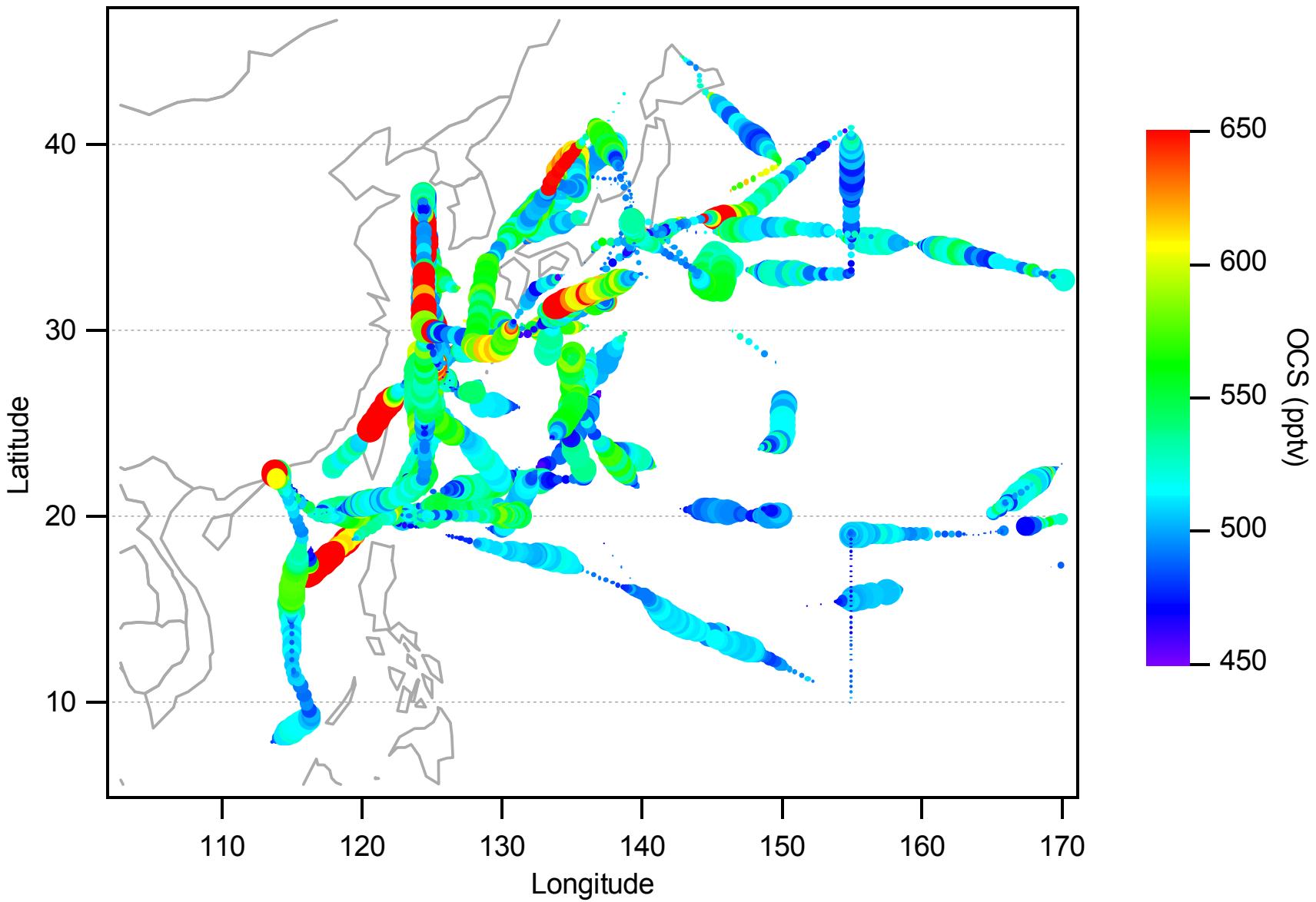
Methyl nitrate: Bromoform relationship TRACE-P and PEM TROPICS



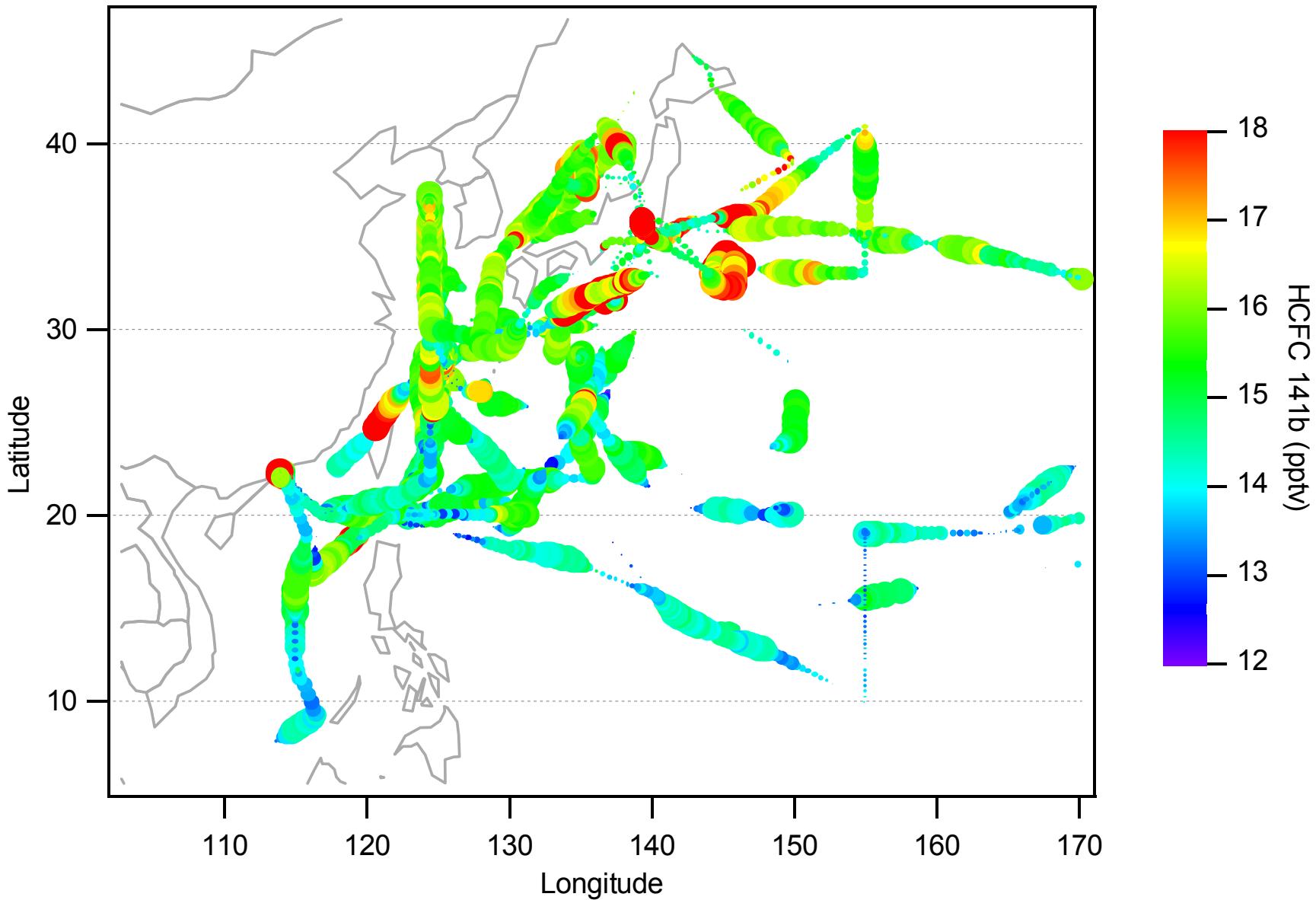
TRACE-P: COS:CO relationship (preliminary data from NCAR+UCI+NASA)



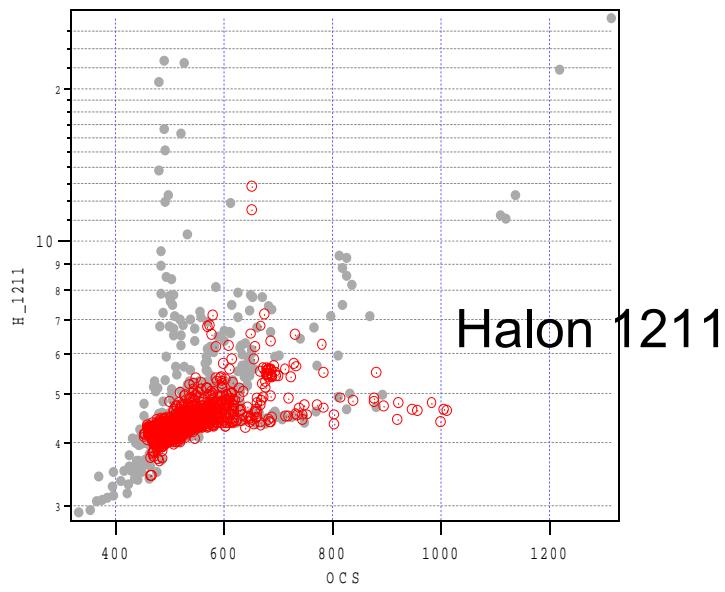
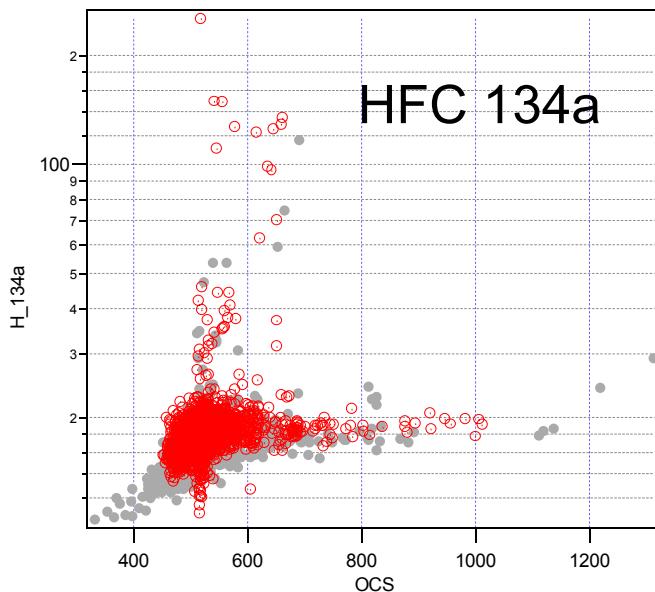
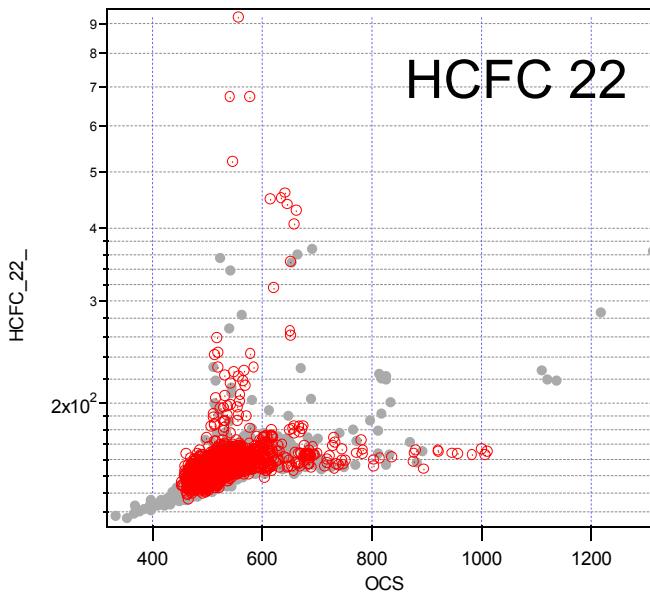
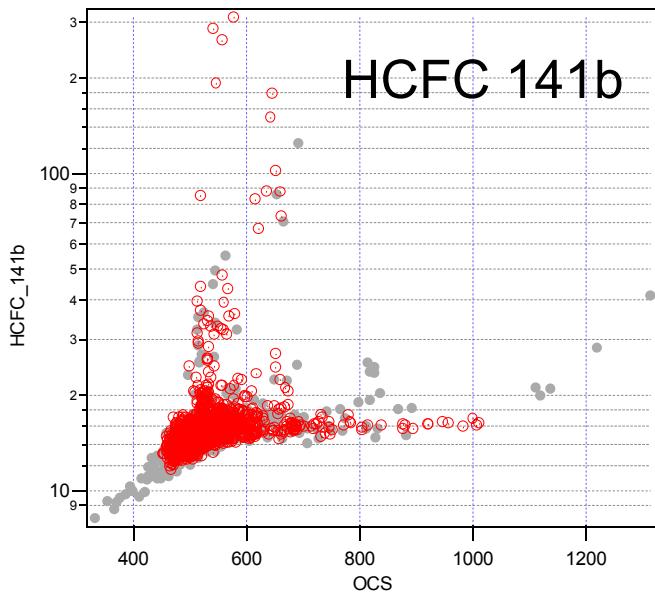
Carbonyl Sulfide distribution during TRACE P

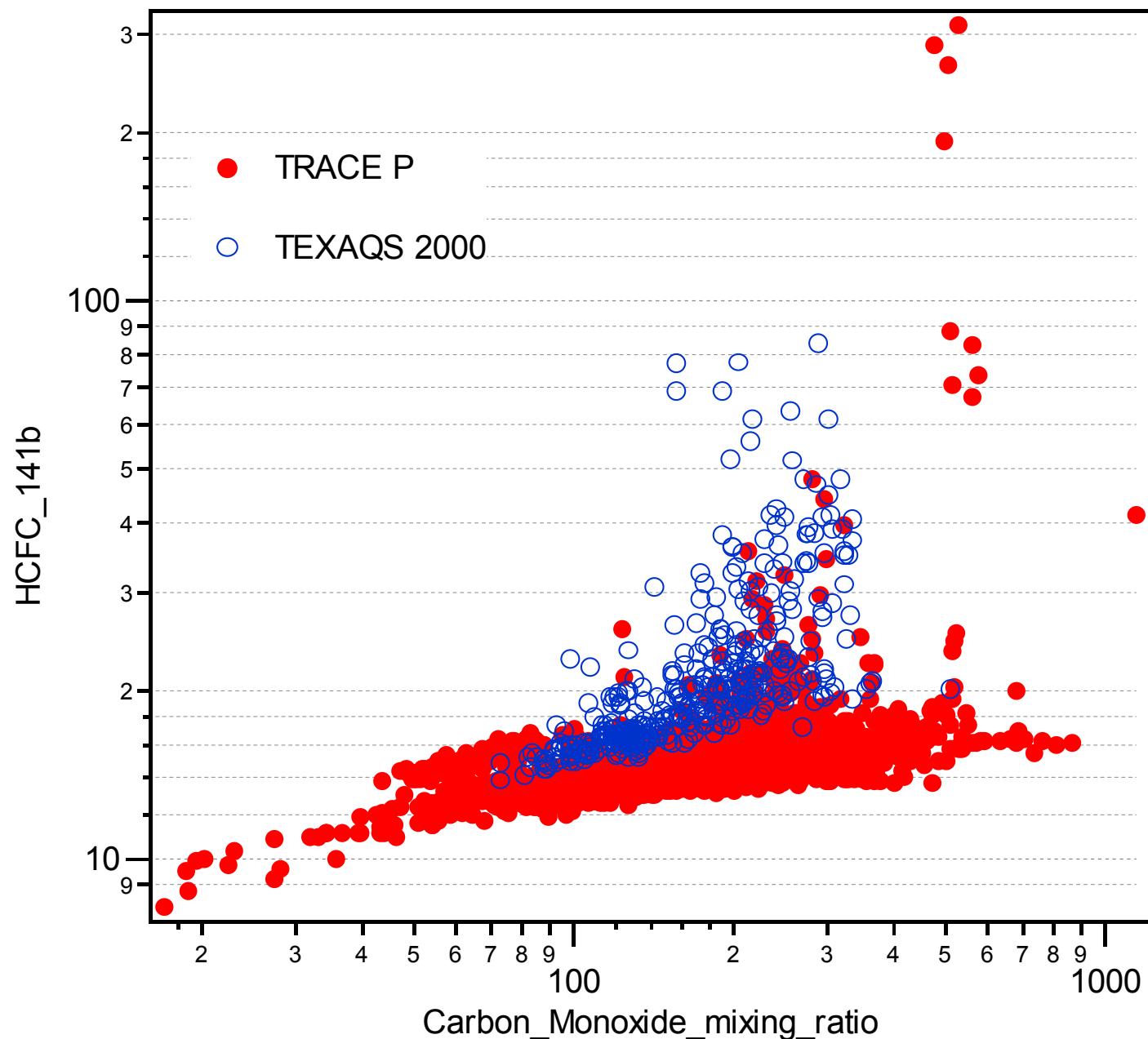


HCFC 141b distribution during TRACE P

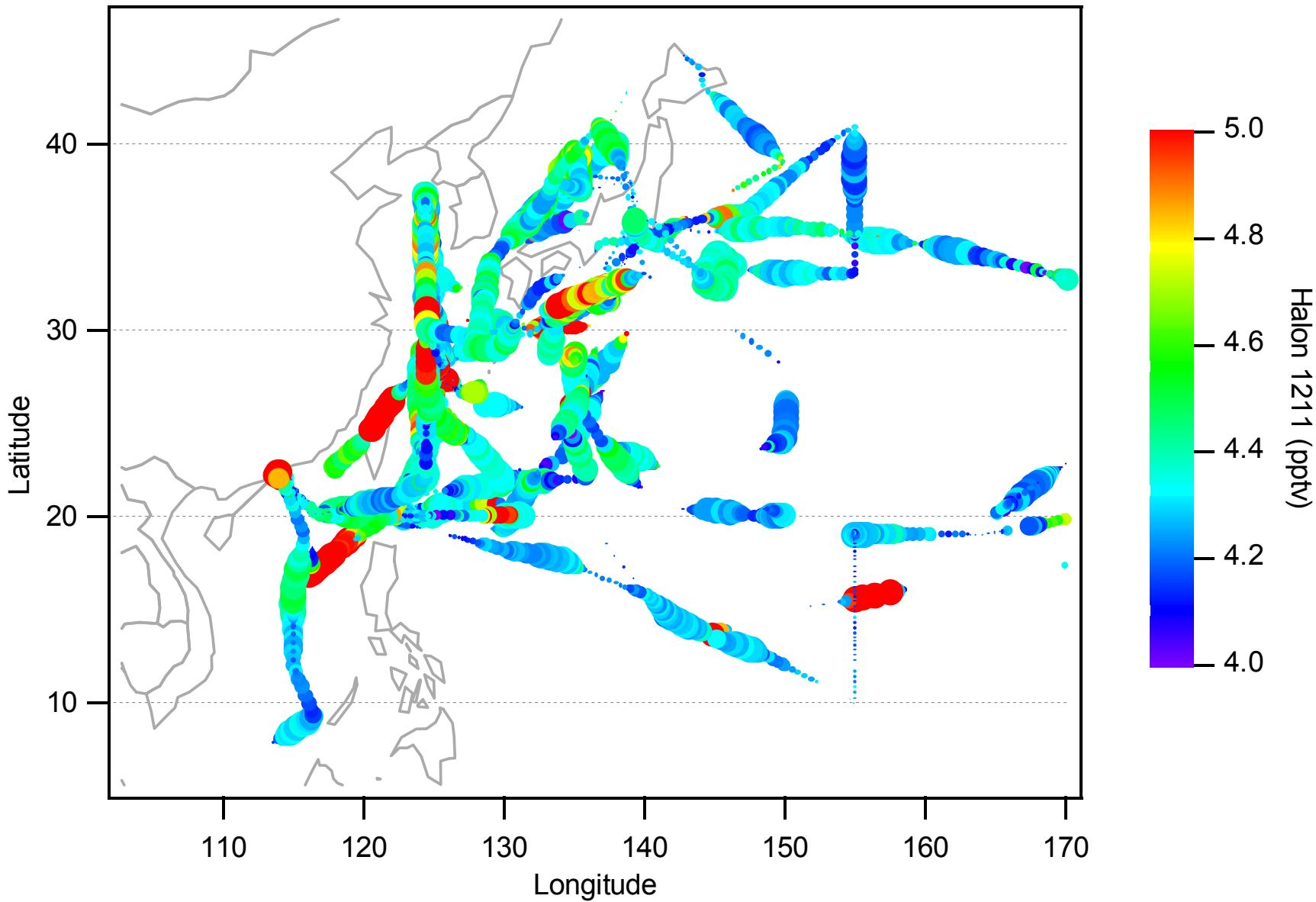


HCFC, HFC, Halon: Relationship to OCS

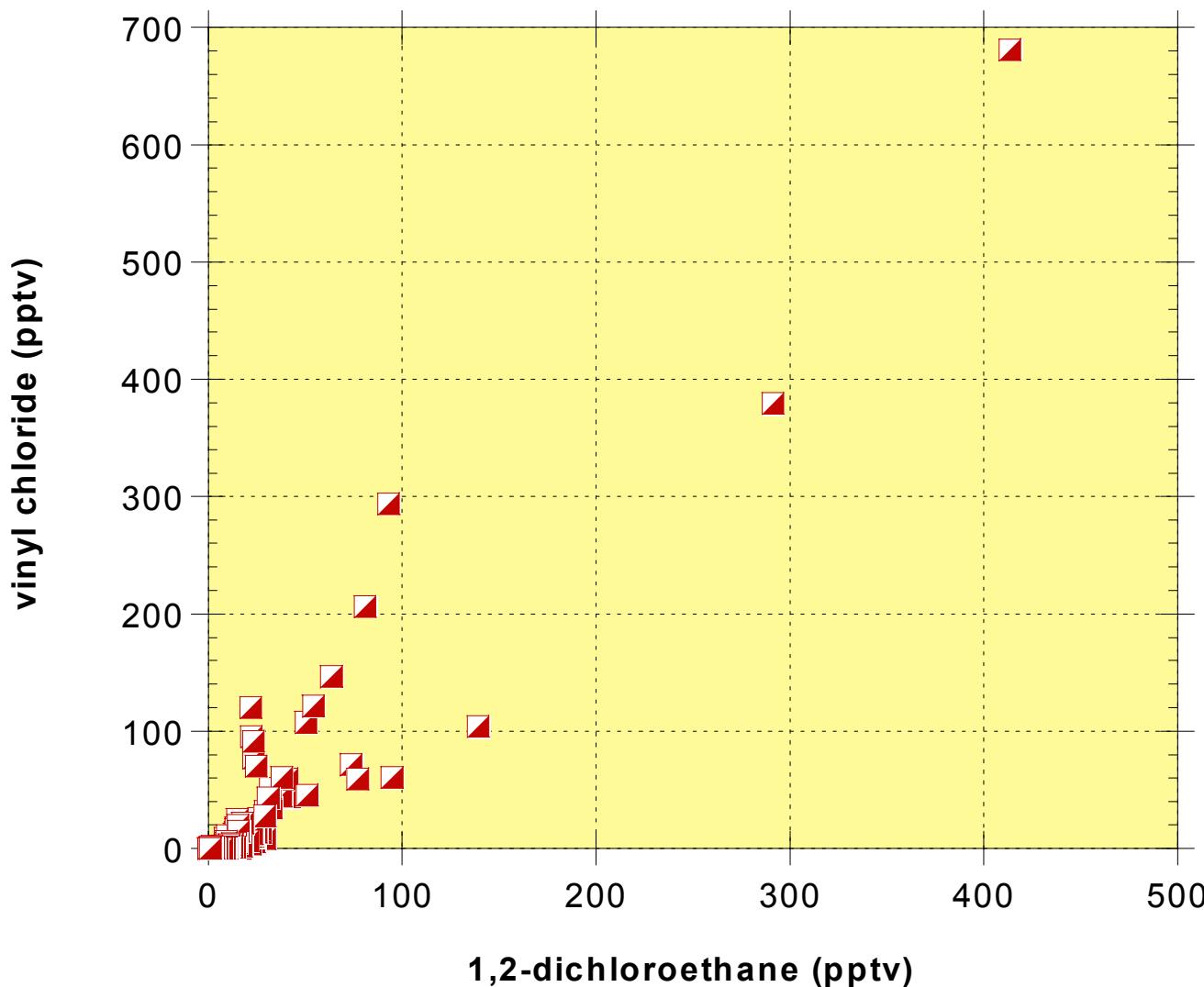




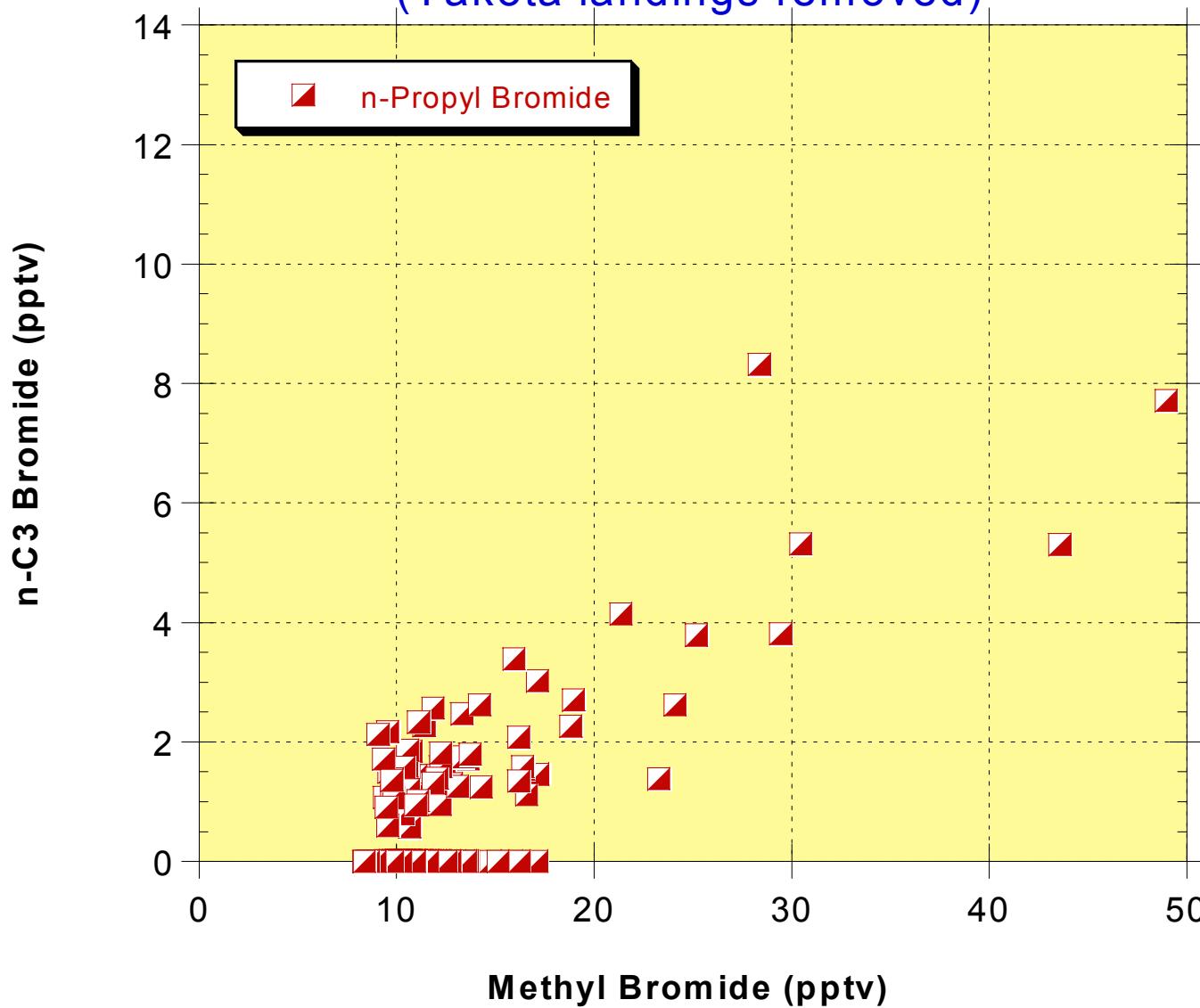
Halon 1211 distribution during TRACE-P



Trace P: Vinyl chloride/1,2 DCE relationship



TRACE-P: Methyl Bromide: n-Propyl Bromide relationship (Yakota landings removed)



TRACE-P: Methyl Acetate-OCS relationship

